

CSE 312 Midterm III (Exam in Class)

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I. PROFESSOR LAKE (20 POINTS)

Professor F. Lake gives the following claim. If we add a constant to each edge weight, the shortest paths from any node s to any node t will not change. Is Professor right or wrong? Either prove that he is right, or give a counter example.

II. CONNECTED COMPONENTS (20 POINTS)

Show that if an undirected graph with n vertices has k connected components, then it has at least $n - k$ edges.

III. ROBBERY (20 POINTS)

During a robbery, a burglar finds much more loot than he had expected and has to decide what to take. His knapsack will hold a total weight of at most 20 pounds. There are 4 items to pick from, of weights 6, 3, 4, 2 and dollar values 30, 14, 16, 9. What's the most valuable combination of items he can fit into his bag? Solve the problem using dynamic programming. Other solutions will not get any point.